PROJOY

PROMIC-3000-10000TM

MPPT Solar Charger and Inverter Integrated Machine

User Manual

Respected customers, we appreciate for using our enterprise, ProJoy Technology Inc.'s product---GF series solar all-in –one off-grid inverter, we sincerely hope that our products can meet your needs, and you will provide more valuable advice on product performance and function. We will continue to be creative, and constantly strive for improving the quality of the products.

Please read this manual carefully before using the product. Please keep this manual together with other product components material to ensure the relevant personnel can make an easy access to them.

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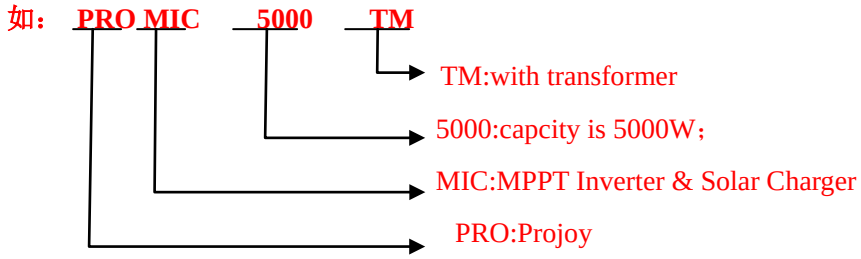
1. Remarks and Safety

1.1 Product definition



1.2 Safety Precautions

In order to keep safe in using, please comply with the followings:

- When under installation, user must leave at least 200mm between inverter and walls to ensure the good ventilation and cooling performance
- It's normal that the temperature of the inverter surface reaches up to 550℃ when it is in operation
- Please do not overload the rated capacity of the inverter.
- Do not open the inverter's case; otherwise it may cause a dangerous electric shock. If you want to have an internal examination please bring it to appointed service center.
- The internal part of the inverter will lead a electric shock or fire by short circuit ,so ,please do not place any vessel that contains liquid in it on inverter ,removing all the possible environments that may trigger shock and the likes.
- If the inverter is in abnormal working status, please cut down the electricity immediately and contact the agents or appointed service center.
- It is strictly forbidden to place and operate the inverter in following environments
- Please do not use liquid fire extinguishers instead of the powder one. It may trigger the danger of shock.
- Please put the socket near the inverter so that you can unplug it to cut off the

electricity supply.

Waining!

- The equipment must be ground. The equipment must be sure for reliable grounding when using with AC power.
- Incorrect operation will cause huge damage, please do operate it adhere to user's manual.

2 Production Introduction

2.1 System Components

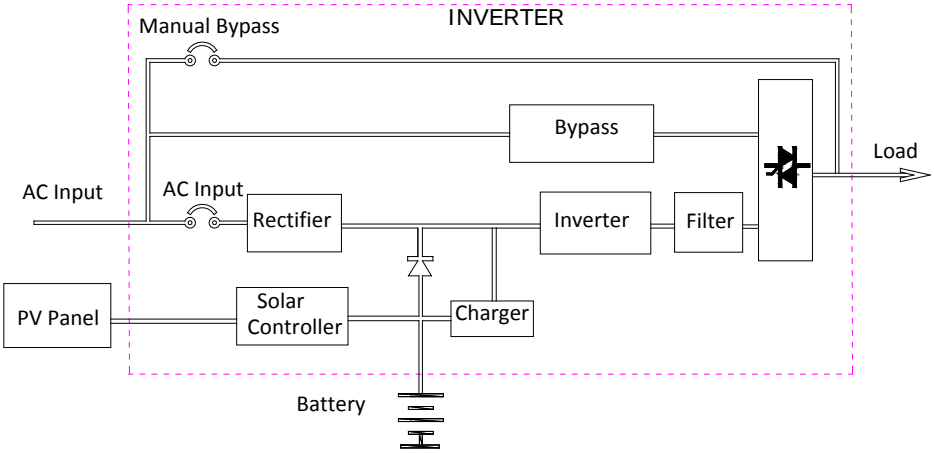
The whole components of off grid PV power supply system include PV module ,array combiner, off grid inverter, battery and load .After electricity combined by array combiner , the electricity that produced by PV modules will goes to DC input of inverter, then to be converted to AC ,finally output ,supporting the load; meanwhile ,inverter will rectify AC input power and invert back to AC then output to load .

Fig. 1 Off-grid system schematic diagram

Attention!

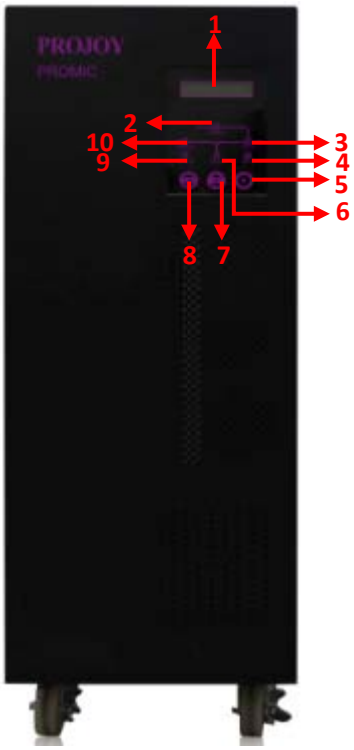
- solar panels' configuration power is related to the inverter working mode and charge current. Proposed in accordance with the views of the project unit configuration.
- when connecting the battery pack wire, make sure that the battery "+" and "-" properly connected, you can not reverse or be short-circuited to prevent security incidents.

2.2 Product diagram



2.3 Appearance Instruction

Front panel:



1) LCD display data screen
2) AC input indicator (orange one)
3) working mode indicator (green/red one)
4) bypass mode indicator (orange one)
5) Screen rolling button
6) Battery status indicator (green/red)
7) Off button "OFF"
8) Inverter Switch "ON"
9) Over load (red)
10) PV input LED (Green/Red)

Rear panel:

11) RS485 and USB interface

12) SNMP Card interface (optional)

13) Pins setting zone

14) Cooling fan

15) Circuit breaker zone

16) Terminal blocks

17) Earth connection

2.4 Main Features

1.： Multi-setting selection

- System working mode can be adjusted to PV priority or AC priority on base of product configuration and light source conditions.
- Charging current can be chosen based on the capacity of battery configurations.

2. High reliability

- Independent MPPT(Max. power point tracker)Micro Control Processor System can make the best use of PV batteries by putting it on the Max. Point to realize battery charging and parameter managements.
- Independent Invert Micro Control Processor System enables more quickly, accurate data processing and control, high-speed online voltage regulation， SPWM modulation techniques come true.
- System possesses over- charge, over –discharge, load short circuit, overload protection, and unique PV anti –polarity connected protection as

well ;

3. Pure sine wave technology with isolation

- The inverter adopt advanced SPWM adjust technology ,high –efficiency MOS, taking the advantage of isolated transformer boost technology , through LC filter to form stabilized voltage and frequency pure sine wave to support the load and deduce the noise interference to it .

4. Advanced MPPT Calculation

- MPPT technology is a kind of control method for Max. power point tracking ， which can adjust the working point of solar batteries intelligently ,keep the battery operating at the Max. Point of I-V characteristic curve and ensure it will give a Max. Power output under different conditions .Comparing this feature to normal solar charge controllers, it will promote 20-30% on solar panel energy transform power.

5. Intelligent charging management

- MPPT control technology , humanized charging settable system
- MPPT Max .power tracks constant current 、constant voltage and interval charging ways
- When over charged and no PV to use, system will charge the battery with constant current automatically once AC recover.

6. LED+LCD display

- Intuitive LED process, state display
- LCD directly display product ‘s running parameters and state in all around

7. On-line working mode

- MPPT control system adopts PWM technology, which can withstand the highest of the open voltage of photovoltaic cells
- Product adopts pure online mode, double switch control principle to ensure the stability of the output voltage, frequency in any input moment, guaranteeing the reliability of the electricity.

8. Human nature alarm system

1) PV priority :

- When photovoltaic battery power supply is in shortage, alarm system will be issued a screaming five seconds once, automatic silence will operate in 40 seconds, and no interference to working environment at all;
- When the batteries run out, inverter will automatically turn off, to protect the batteries.

2) AC priority：

- At the initial stage of the battery (or photovoltaic battery) power supply, that will be issued five seconds once sounding alarm, after 40 seconds ,automatic silence, no interference to working environment at all;
- When the battery is about to run out, inverter start rush of screaming alarm again, the frequency is 0.2 seconds once a time to remind workers the batteries going to be run out and the inverter is about to shut down;
- When the batteries run out, inverter will automatically turn off, to protect the batteries.

9. On-line protection:

- Normally ,when overload reaches 110%, systems warning, in 255 seconds, if load is reduced to the rated range, system comes back to normal power supply circumstance ; Over time, the system will automatically turn to bypass power supply or shut down, the utility recovers (or manual boot) system restore to automatic power supply.
- Inverter overloads 120% abnormally: systems warning, in 60 seconds if load is reduced to the rated range, system comes back to normal power supply circumstance ; Over time, the system will automatically turn to bypass power supply or shut down, the utility recovers (or manual boot) system restore to automatic power supply.
- Inverter l overloads 120% abnormally: systems warning, in 60 seconds if load is reduced to the rated range, system comes back to normal power

supply circumstance ; Over time, the system will automatically turn to bypass power supply or shut down, the utility recovers (or manual boot) system restore to automatic power supply.

- Short circuit protection: instant impact, short circuit, the equipment will limit output current, if more than 10 ms, system will automatically turn off.

10. Intelligent no-load shutdown (optional)

- In battery (or solar power supply)condition, the system will automatically detect load, if it is less than 5%, inverter will judge it as "no-load condition", in order to reduce energy loss, system will automatically turn off in no-load condition for 1 minute.

11. Automatic frequency selective

- When inverter accesses to AC frequency 50 Hz or 60 Hz, the system will automatically detect it , when the AC cut down , inverter output voltage and frequency will as same as utility(frequency 50 Hz or 60 Hz).

12. Intelligent communication interface (optional)

- This series of inverter can be chosen with RS232 、USB or RS485、 SNMP monitoring interface together , connecting to PC communication, monitoring and supporting Windows/NT / 2000 / ME / 2003 / XP/Vista operating system to automatic file storage and inverter shutdown and boot control.
- Automatically detect the interruption of the utility 、the low voltage condition of inverter and the data of inverter running (LCD inverter).
- When utility disrupts, system starts to countdown, the action which will be done within the time are saving files, closing system and inverter in order automatically.
- Systems power supply time setting、 record the history material of inverter running condition 、 utility state and the likes .
- Display system shuts down within countdown; you can set inverter with functions of self- diagnosis test, regular boot and shutdown.

13. Dry contact port(optional)

- The inverter provides passive dry contact: Battery low voltage, PV failure,

inverter failure, bypass, overload and remote start generator dry contact signal.

2.5 Specifications

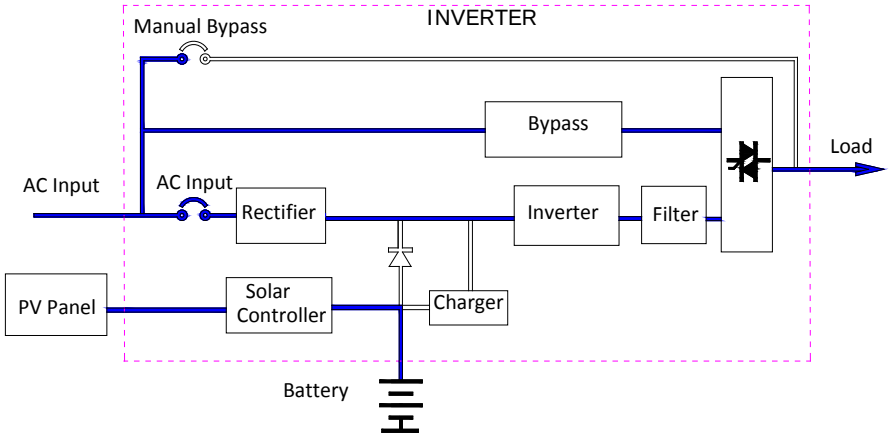
Model		GF3000	GF4000	GF3000	GF5000	GF6000	GF8000
Power		3KW	4KW	3KW	5KW	6KW	8KW
Battery voltage		96Vdc		192Vdc			
Working mode		PV Priority/ AC Priority optional					
PV	Input voltage range	96-200Vdc		192-400Vdc			
	Max. charging current	10-40A /60A (settable)					
	PV panels configuration (Suggestion) （Vmp）	120-142Vdc		240-284Vdc			
	PV panels configuration (Suggestion) （Imp）	≤60A		≤40A	≤60A		
	Max .efficiency	98%					
Display	Panel Indicators	LCD+LED Panel display					
AC mode (settable)	Input voltage range	165Vac- 275Vac					
	Input frequency range	45-65Hz（autoly transfer to battery mode beyond this range）					
	Output voltage range	220Vac± 5%					
	Input power factor	≥80%					
	Max. efficiency	88%（inverter on）					
	Over load	110% transfer to bypass in 255s,120% go to bypass in 60s, 150% go to bypass in 10s.					
	Max. charging current	8A		12A			
	Short circuit protection	Electronic limited current output or turn bypass, air breaker protection					
Inverter output	Output voltage	220Vac± 5%					
	Output frequency	50 Hz / 60Hz ± 1% Frequency self –adjusted					
	Output power factor	≥0.8					

	Distortion	≤5% Linear load
	PV-AC Transfer time	≤0Ms
	Max. efficiency	92%
	Overload	110% transfer to bypass, in 255s or shut down,120% go to bypass or shut down in 60s, 150% go to bypass or shut down in 10s.
	Eco mode (optional)	When Load < 5%, system will turns to bypass power supply (utility) in 1min
	short circuit	Electronic limited current output, turn the bypass or system to be automatic shutdown
Alarm	AC fails	4s once ,noise reduction after 40s
	Battery low voltage	0.2S Once
	over load	1 / 1S
Communication（optional）	Communication interface	RS232 / USB /RS485/ SNMP
	Dry contact	PV failure、battery low-voltage、overload、bypass、inverter failure/ remote start generator dry contact signal
Others	Connection	Terminal blocks
	Surge protection	optional
	Magnetic Compatibility	Accord with EN62040-2:2006;EA61000-3-2:2006; EA61000-3-3:2008
	IP class	IP20
	Temperature	0℃ ～ 40℃
	Humidity	10% ～ 90%(non condensing)
	Noise	≤50dB
	Working altitude	2000m（Every 100m increase derating 1% ）
	Inverter Size D*W*H（MM）	560*265*725
	Packing size D*W*H（MM）	662*360*905

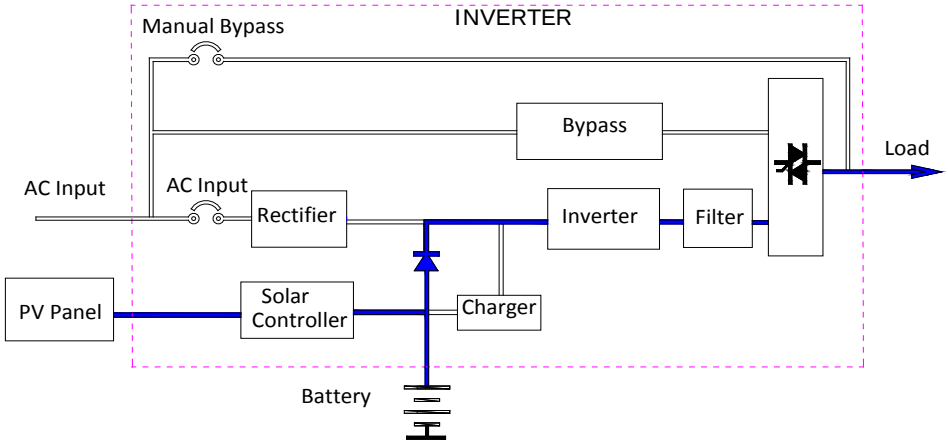
2.6 Working Mode Introduction

2.6.1 AC Priority Mode

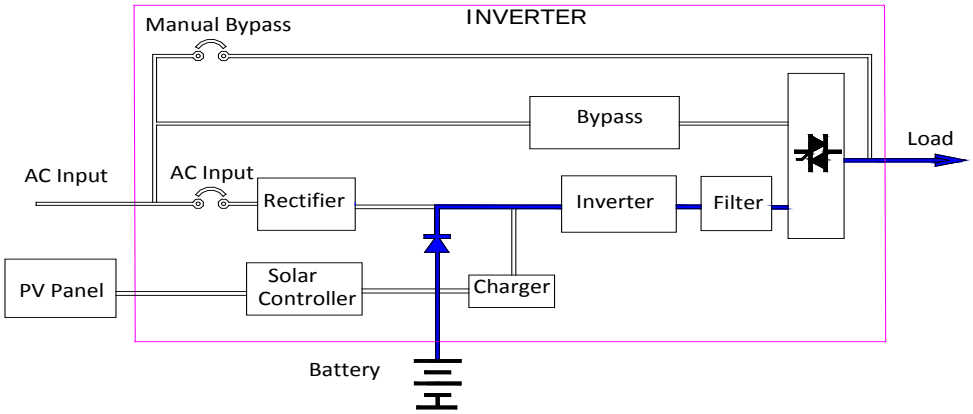
1） AC Power Supply Normal: The mains power goes through rectifier, and then inverter, then after filter to user facility. At this time, the PV energy controlled by inner MPPT, only supply power to charge battery.



2） The mains overload or cut-off: When the mains is out of range or outage occurs, the system will be supported quickly by transferring the power of battery and PV energy into AC power, then ensured the continuous power supply.

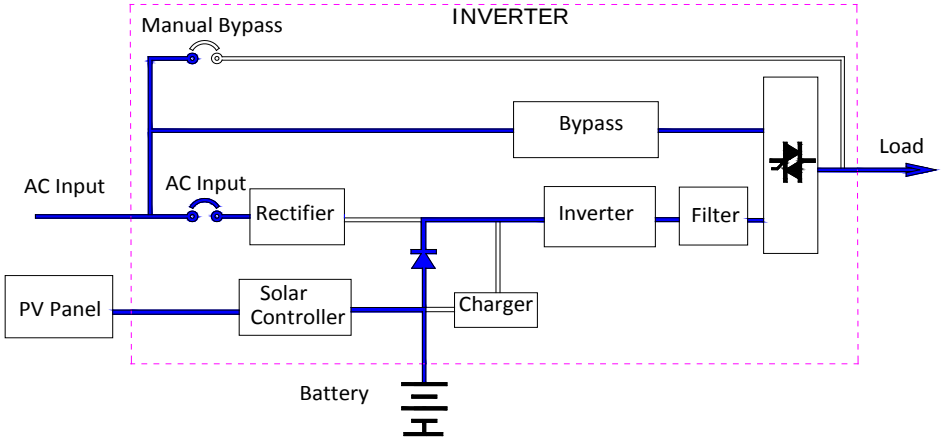


3） The mains out of work or cut-off, and no PV: When the mains is out of work or blackout occurs, the system will be supported quickly by transferring the power of battery and PV energy into AC power, then ensured the continuous power supply.

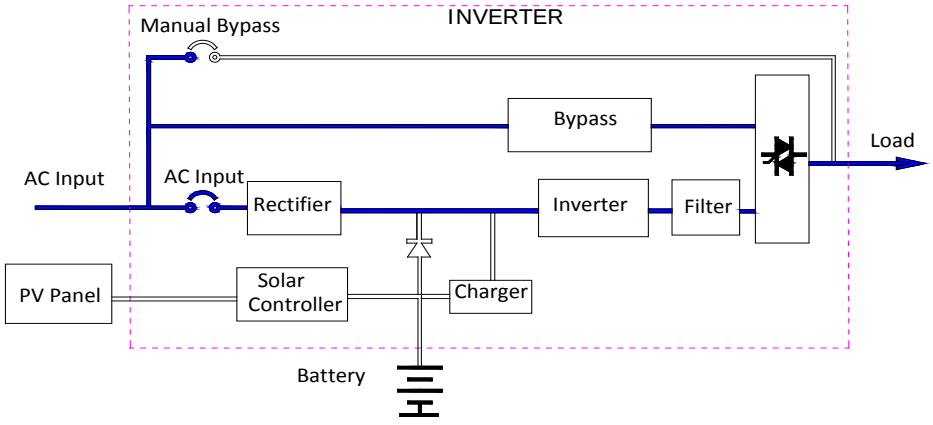


2.6.2 PV Priority Mode

1） On the daytime, with sufficient sunshine, the mains normal: Solar Panels' power will be adjusted by solar controller into the maximum power supply condition, going through the inverter for load use (the mains is on the stand by state),and to charge the battery at the same time.(shown as below);

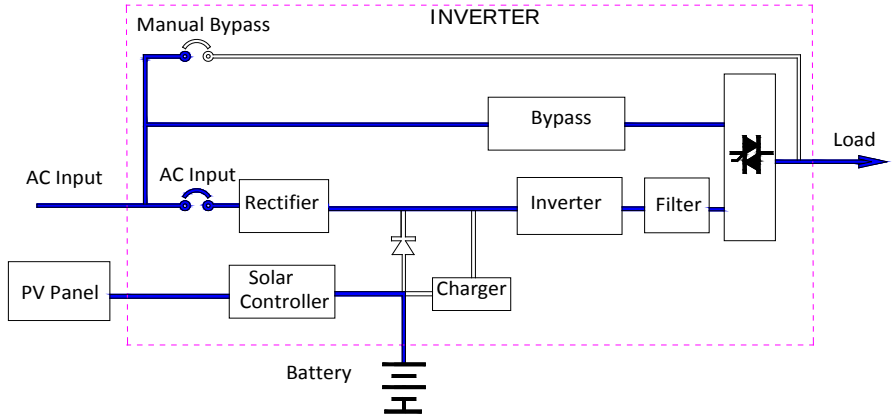


2） At night, the mains normal: the system will be supported by the battery, while discharged to a setting value (reserve a certain amount of energy for emergency use), then switch automatically to the mains, going through rectifier, inverter and filter to supply power for the load (shown as below);

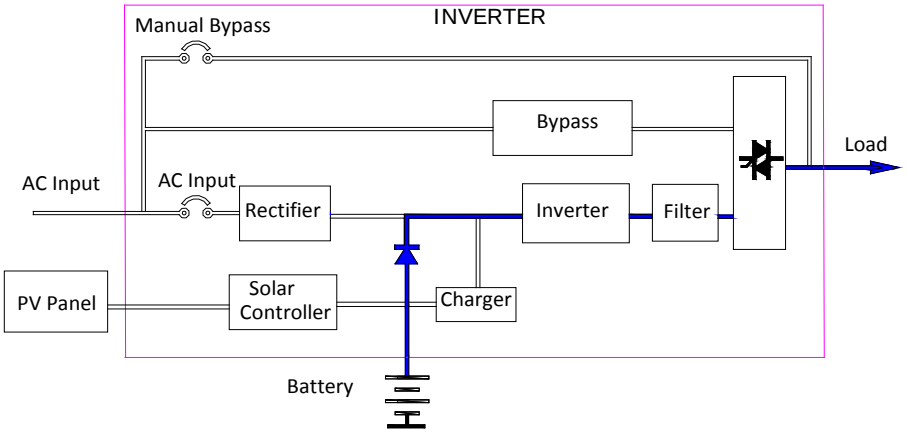


3） On the rainy days, insufficient sunshine, and the mains normal: The system will be first supported by PV, and supplemented by the battery. While the battery is discharged to a setting value (reserve a certain amount of energy for emergency use), the system will switch automatically to the mains, going through rectifier, inverter and filter to supply power for the load (shown as below); at the same time PV will charge the battery. When the battery is about to be full, system will

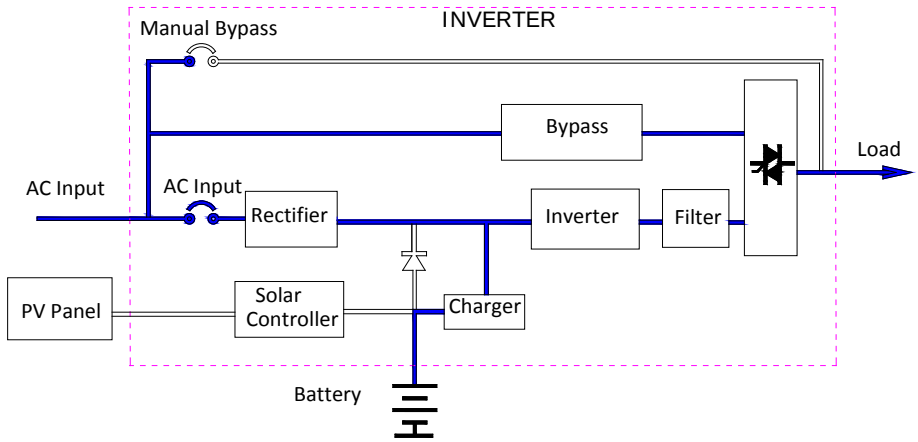
activate PV power supply mode again;



4） At night, the mains abnormal: system will use battery energy, going through rectifier to supply power for the load;



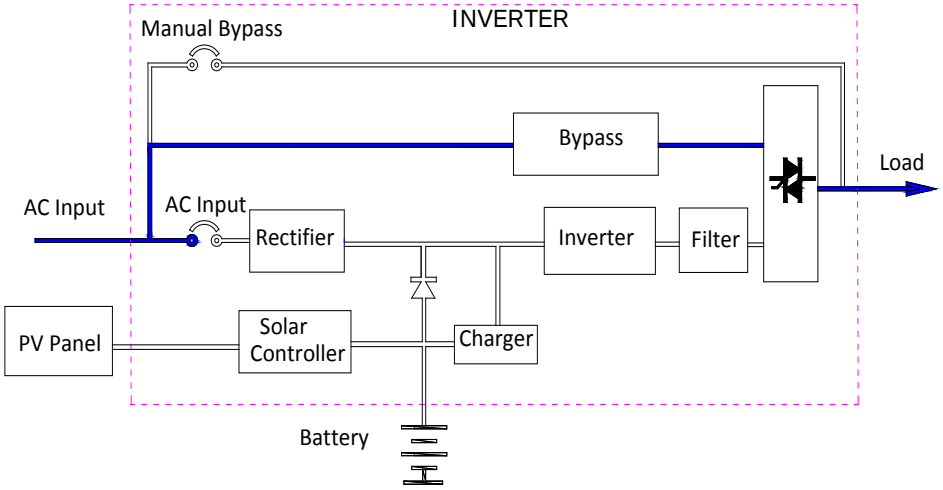
5） At night (or no sunshine unavailable in rainy day), battery fully discharged, and the mains back to normal: system will switch to the mains, going through rectifier to supply power for the load and activate the charger simultaneously to charge the battery (shown as below);



2.6.3 Bypass Power Supply Mode

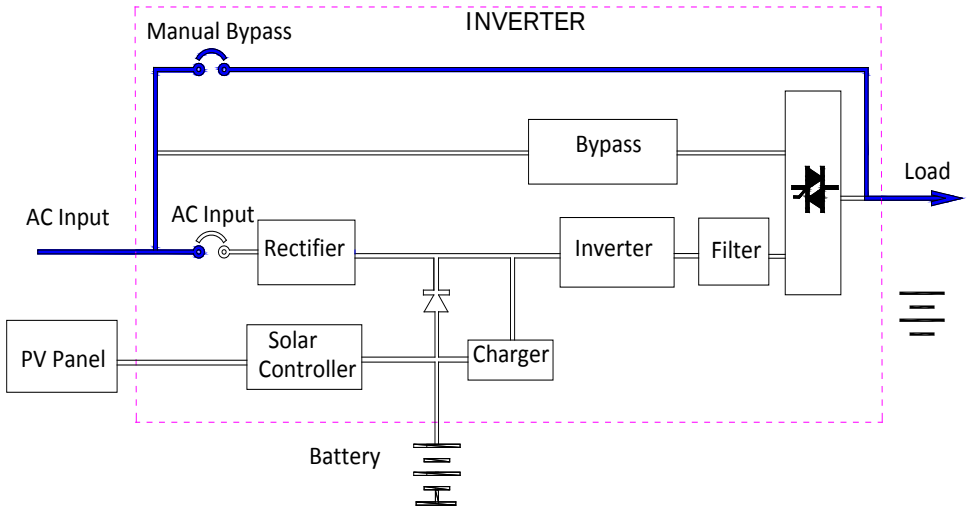
Load will be supported by bypass under the following four conditions :

- OVER LOAD;
- Inverter FAILURE;
- ON: press the ON button by 3seconds. Inverter processes soft start within 15seconds;
- OFF: press the OFF button by 3seconds，inverter shuts down, bypass autoly.



2.6.4 Maintenance Mode

When inverter needs maintaining for the inner fault, system should be switch ed into maintenance bypass model



3 Installation

3.1 Requirements of the environment

To ensure that the machine functions well, please pay attention to the following environmental requirements:

- Do not put it in the moist place since the inverter is an indoor and electronic product; It's better to put in the dry and little dust area.
- Indoor installed to avoid sun and rain, relative humidity (RH) 10-95% is allowed, no condensing.
- Keep enough space against the wall for ventilation cooling, installation and maintenance, and exit.
- Try no to install it near the place where people live since the machine will produce some noise.
- No sway for installation area.
- Make sure people can see the LED/LCD display easily.
- Environment temperature should be in a certain range(0°C ～40°C).
- It is well ventilated around the machine.
- Clean installation environment

3.2 Wiring connection

According to the wiring mark at the back of the machine, the order from right to left is PV input, DC input, AC input; please refer to the following chart for AC output connection and connector bar.

N	L	N	L	BAT-	BAT+	PV-	PV+
AC OUTPUT		AC INPUT		DC INPUT		PV INPUT	

For output L、N connection

For AC input L、N connection

For battery connection

For PV connection

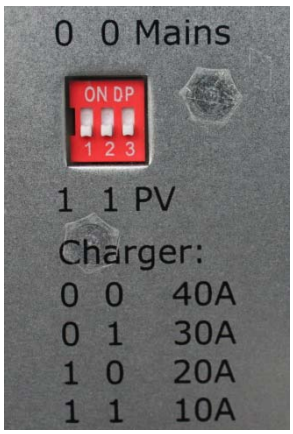
Attention!

- Polarity of the connecting wire should be correspondent with the marking, no reverse connect, and otherwise it would cause the damage of the machine.
- While Input and output connect to the earth wire, connect to ⏚ (mark) and make sure the Earthing wire's diameter is not less than 10mm.
- Turn the machine on after you make sure everything is right checked.

4 Operation

4.1 Working Mode Setting

Before turning the machine on, ensure machine mode is set according to the requirements. Check the code dial salver, totally 3 positions, in the back of the machine. The first two are for charging current setting, the number setting and the correspondent charging current value is shown as follow. The third one is to choose AC priority mode and PV priority mode; up means AC priority, down means PV priority) .



SW-1	SW-2	SW-3	Function
**	**	Mains	AC Priority mode
**	**	PV	PV Priority mode
0	0	**	PV Max. charge current 40A/60A
0	1	**	PV Max. charge current 30A
1	0	**	PV Max. charge current 20A
1	1	**	PV Max. charge current 10A

4.2Machine ON/OFF

1) According to users' configuration and requirement, make sure the working mode (AC Priority or PV Priority).

2) When there is Mains power: Turn on the AC input switch on rear panel of inverter, inverter will start self-testing and output through bypass and will be in normal condition in 15 seconds, the user can start PC and other load at this moment

3）When PV/Battery supply power (no Mains): Turn on the switch of battery group and PV confluence box, press "ON" button on the front panel in 3 second. The system will supply power normally.

1) Daily start: Press the start button ("ON") for 3 seconds, inverter will output normally in 15 seconds.
2) Daily shut-down: Press the shut-down button ("OFF") for 3 seconds, inverter will turn to bypass mode if the Mains power is on. And bypass LED will be on at the moment. Otherwise the inverter will shut down.

4.3ON and OFF operation after long time storage of inverter

1）When unused the inverter for 7 days, please push the shut-down bottom to turn off the inverter firstly, then turn off input switch/PV connection box switch/battery switch on the rear panel again.

2 ）If unused above 3 months, please turn on battery and PV connection switch, let the system charge above 12 hours to keep the battery in a full power situation, to extend the life span of the battery.

4.4. Operating steps of turning on and off maintenance switch：

1） Operating steps of turning on maintenance switch：
1) Before using maintenance switch, turn off the inverter or UPS, let the device be bypass mode or power off;
2) Take off the lock catch on "MANUALBYPASS" switch; switch on "MANUALBYPASS";
3) Switch off the inverter or UPS "AC OUTPUT" switch, at the same time, lock the lock catch at this switch (inhibit closing this switch);
4) Start maintaining and testing the inverter or UPS.

2） Operating steps of turning off maintenance switch：
1) Let the inverter or UPS be bypass mode or power off;
2) Take off the lock catch on "AC OUTPUT" switch, switch on the inverter

or UPS “AC OUTPUT”;

3) Switch off the “MANUALBYPASS” switch, at the same time, lock the lock catch at this switch (inhibit closing this switch);
4) Turn on the inverter or UPS.

Attention!

- Products with battery detection function, you must ensure that the battery is properly connected before switch on.
- When you turn on the inverter, please turn on the computer and other load firstly; when you shutdown the inverter, please turn off the computer and other load firstly and then turn off the inverter.

5 Display

1) LCD screen：

- Name and specification of the product：

Solar Inverter PROMIC 5000TM

- PV input status &battery status:

PV Overvoltage BAT OK

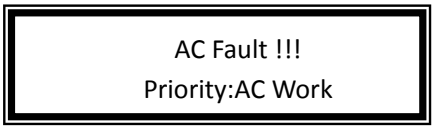
PV Ok BAT Undervoltage

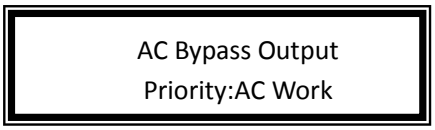
PV Undervoltage BAT Overdischarge

PV Reverse!!! BAT Fault!!!

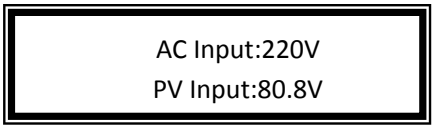
- AC input status and system working mode:

AC OK Priority:PV Work

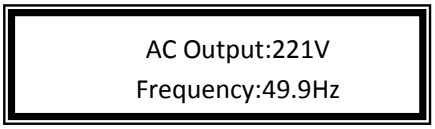


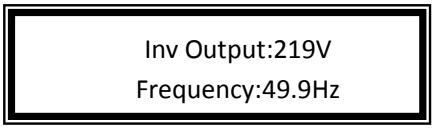


- Input Voltage status display:

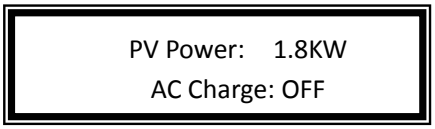


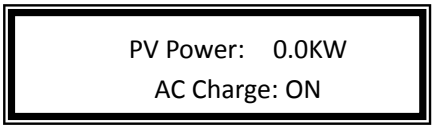
- Output Voltage status display:



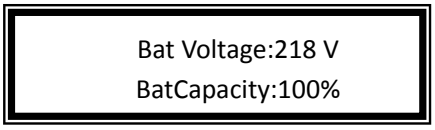


- Charging status Display

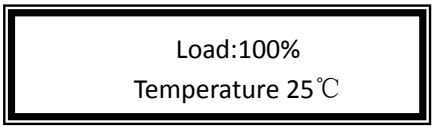


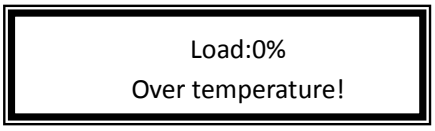


- Battery status Display

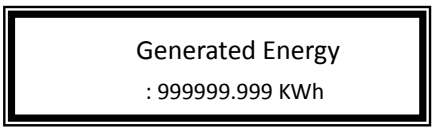


- Load status Display





- Power status display



2) AC indicator (orange): Indicator on when there is input main power.

3)Working status indicator (Green/Red): Red indicator on when there is AC input, green indicator on when PV/battery supply the power.

4) Bypass indicator(orange)： Indicator is on when the inverter is working with AC input.

5) Battery status indicator (Green/Red): Green indicator on when battery works normal, red indicator on when battery low voltage.

6) “ON” button, press 3sec to turn on inverter, and it will start to supply power after 15sec.

7) “OFF” button, press 3sec to turn off inverter (inverter will turn to bypass if had AC input, and bypass indicator on).

8) LCD scroll button, press it to scroll LCD display contents.

9) Overload indicator (red): When system overload, Indicator will on and come with buzzer alarm.

10) PV input indicator (green/red): Green indicator on when PV connect correct and voltage input normal; Red indicator on when PV connect reverse and it has input voltage

6 Maintenance

1． Preventative Maintenance

Preventative maintenance to the inverter can guarantee the reliability and long-time service; do some test per month as follows:

1. Shut-down the inverter (Refer the operation steps for details)；
2. Check the vents not be blocked；
3. Check whether there is much dust covering the surface；
4. Check the connection of input, output as well as batteries to see whether it is firm and the insulating barrier of cable；
6. Make sure the product not damp；

7. Start inverter（ON/Off）;

2. Battery Maintenance

Valve Regulated Sealed Lead Acid battery is used in this system. The life time of battery will be reduced by bad operating environment, frequently discharging, and sharply temperature rising. Even battery is not in use, its performance can be gradually degraded. That is why we advise to discharge it every 3 months if there is no power-off for long time.

There are maintenance steps as follows (the performance will get degraded very fast, please keep the following operations of battery maintenance in mind).

1). When the battery stay at idle status for 3 months or more than 3 months, switch on the battery and PV confluence box, charge battery up to12 hours, to keep the battery stay at full potential, to make battery life longer.

2). Make records of the load status and the total power, then shut off the PV convergence box switch, start the system, getting into the battery discharge mode until auto- off. Make records of the discharge time. Also keep the initial discharge time records for future reference.

- The total power of load (power consumption) is calculated in unit of "Watt"
- If the inverter marking just shows power capacity in "VA", then need to multiply power factor(if no marking, it is 0.8) to calculate in unit of "Watt"
- If there is just Ampere value marked, then multiply rated voltage and power factor to calculate in "Watt"

3).Under normal using condition, the life time of battery is near 1-3 years. If battery temperature and discharging frequency is high, the life time will be near 0.5-1 year.

4). Along with the running time, the performance of battery is generally degraded (regarding discharging time). If the discharging time reduces to be 80% of its initial time, performance is degrading fast. So, battery maintenance should be done monthly.

5). Dust treatment:

- Clear the dust on battery.
- Check the connection cables between batteries to see whether they are loose or not, if necessary, replace the cable even the battery.
- Keep the battery and cable connection tight.

Attention!

The discharging test above is just a simple test to check the battery charging status and performance. If needing know more exact information about battery charging status, should contact with battery supplier locally.

3.Trouble shootings

The inverter can offer reliability to the load. If abnormal accident occurs, suggest you go to local

service center, so as to prevent more damage and unnecessary fee. When the inverter is in abnormal status, you can refer the following trouble shootings. If can't solve problem, please get in touch with local distributor, or contract direct with our company

Phenomenon	Confirmation and Solution
Main power is normal, main power indicator is off	1, whether Cable is loose. 2, whether fuse is burnt.
In AC priority mode, system doesn't transfer to mains mode, even mains power is ready, and switch is on, but ac LED off, and buzzer beeps	Over current protection is ejected, reset over current protection
In PV priority mode, PV is normal, but AC supply power	PV solar power is not strong enough. The system is charging, it is a normal situation.

7 Appendix

7.1 Quality Assurance

Warranty

This product warranty period is 12 months, any additional provisions proof by the contract.

Evidences

During the warranty period, the purchase invoice and purchase date is required and the trademarks should be clearly visible on products, otherwise the right not to be assurance by the warranty.

Conditions

PROJOY Power Supply will repair or replace if products have any faults during the warranty period.

The faulty products need to return to PROJOY Power Supply

Customers expected give PROJOY Power Supply to have a reasonable amount of time for repair the faulty equipment

When the following occurs, our company reserves the right not to conduct the quality assurance:

The Whole Machine, components already exceed the warranty for free

Transportation damage

Incorrect installation, modification or use

Beyond the very harsh environment to run described in this manual

Machine’s fault and damage caused by not PROJOY professional’s installation, repair, alteration or demolition

Mechanical failure or damage caused by the use of not PROJOY components or software

Anything beyond the range of installation and use of relevant international standards.

Damage caused by unnatural and non-normal environment

Customers requires for maintenance service due to the product failure caused by above, PROJOY will provide the maintenance service after determine the damage

If the product size and parameters are changed, to our latest material shall prevail without prior notice

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